

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

RECEIVED
CENTRAL FAX CENTER
NOV 18 2009

PATENT
Docket: CU-4737

Amendments To The Claims

The listing of claims presented below will replace all prior versions and listings of claims in the application.

Listing of claims:

1. (currently amended) A field emission device comprising:
 - a cathode portion having a substrate, a cathode electrode formed on the substrate, and a field emitter connected to the cathode electrode;
 - a field emission-suppressing gate portion formed on the cathode portion around the field emitter and surrounding the field emitter; and
 - a field emission-inducing gate portion formed on top of the field emission-suppressing gate portion having a metal mesh with at least one penetrating hole that surrounds electrons being emitted from the field emitter, and a dielectric layer surrounding the side of the metal mesh in the penetrating hole and adapted to prevent the electrons emitted from the field emitter from directly colliding with the metal mesh,

wherein ~~the field emission-suppressing gate portion suppresses electrons from being emitted from the field emitter, and the field emission-inducing gate portion is adapted to induces induce~~ electrons to be emitted from the field emitter when an electric field is applied to the metal mesh in a direction of the field emitter, and the field emission-suppressing gate portion is adapted to suppress electrons from being emitted from the field emitter when an electric field is applied to the field emission-suppressing gate electrode in a direction opposite to the electric field applied to the metal mesh, and

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

wherein the field emission-suppressing gate portion is electrically insulated from the field emission-inducing gate portion, and has an insulator with a field emission-suppressing gate opening therein, and a field emission-suppressing gate electrode formed on the insulator.

2. (original) The field emission device according to claim 1, wherein the dielectric layer of the field emission-inducing gate portion is formed on an entire surface or a portion of the surface of the metal mesh.
3. (previously presented) The field emission device according to claim 1, a largest cross-section of the penetrating hole of the field emission-inducing gate portion is not greater than one time to three times a thickness sum of the metal mesh and the dielectric layer.
4. (original) The field emission device according to claim 1, wherein the penetrating hole of the metal mesh has at least one inclined inner wall.
5. (original) The field emission device according to claim 4, wherein the dielectric layer covers the inclined inner wall of the penetrating hole.
6. (cancelled).
7. (currently amended) The field emission device according to claim 6, wherein

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

a largest cross-section of the field emission-suppressing gate opening is one time to twenty times a thickness of the insulator.

8. (original) The field emission device according to claim 4, wherein the inner wall of the metal mesh includes a protrusion having at least two inclined angles.

9. (original) The field emission device according to claim 1, wherein the metal mesh of the field emission-inducing gate portion is a metal plate formed of one of aluminum, iron, copper and nickel, or an alloy plate containing at least one of stainless steel, invar and kovar.

10. (previously presented) The field emission device according to claim 1, wherein the field emission-suppressing gate portion is divided into a plurality of openings, wherein the penetrating hole of the field emission-inducing gate portion is one per unit pixel.

11. (currently amended) The field emission device according to claim 1, wherein a size of the penetrating hole in the metal mesh ~~of the metal mesh on top of the field emission-inducing gate portion~~ is larger than that of the field emission-suppressing gate portion opening.

12. (original) The field emission device according to claim 1, wherein the field emitter is formed of a thin or thick film formed of one of diamond, diamond like carbon, carbon

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

nanotube, and carbon nanofiber.

13. (original) The field emission device according to claim 12, wherein the field emitter is formed by directly growing any one of diamond, diamond like carbon, carbon nanotube, and carbon nanofiber on the cathode electrode using a catalytic metal.

14. (original) The field emission device according to claim 12, wherein the field emitter is formed by printing a paste containing any one of powder type diamond, diamond like carbon, carbon nanotube and carbon nanofiber.

15. (currently amended) A field emission display device comprising:
a cathode portion including cathode electrodes and field emission-suppressing gate electrodes arranged in a stripe form to allow matrix addressing to be carried out and insulated from each other on a substrate, and pixels defined by the cathode electrodes, and

wherein each pixel having a field emitter connected to the cathode electrode;
a field emission-suppressing gate portion having an insulator with a field emission-suppressing gate opening in a field emission-suppressing gate of the cathode portion formed on a region around the field emitter in the form of surrounding the field emitter that surrounds electrons being emitted from the field emitter;

a field emission-inducing gate portion having a metal mesh and formed on top of the field emission-suppressing gate portion with at least one penetrating hole allowing electrons emitted from the field emitter to pass therethrough, and a dielectric layer

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

surrounding the side of the metal mesh in the penetrating hole and adapted to prevent
the electrons emitter from the field emitter form directly colliding with the metal
mesh; and

an anode portion having an anode electrode and a phosphor connected to the anode electrode,

wherein ~~the field emission-suppressing gate portion suppresses electrons from being emitted from the field emitter, and the field emission-inducing gate portion is adapted to induces induce~~ electrons to be emitted from the field emitter so that the electrons emitted from the field emitter collide with the phosphor via the penetrating hole, and the field emission-suppressing gate portion is adapted to suppress electrons from being emitted from the field emitter when an electric field is applied to the field emission-suppressing gate electrode in a direction opposite to the electric field applied to the metal mesh.

16. (currently amended) The field emission display device according to claim 15, wherein the cathode portion, the field emission-suppressing gate portion, the field emission-inducing gate portion, and the anode portion are vacuum-packaged such that the field emitter of the cathode portion is opposed to the anode electrode of the anode portion via [[a]] the field emission-suppressing gate opening and the penetrating hole.

17. (original) The field emission display device according to claim 16, wherein a constant direct current voltage is applied to the field emission-inducing gate portion to induce electron emission from the field emitter of the cathode portion, and a scan signal

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

having a negative voltage is input to the field emission-suppressing gate portion and a data signal having a positive or negative voltage is input to the cathode portion to display an image.

18. (original) The field emission display device according to claim 17, wherein a pulse amplitude or a pulse width of the data signal is modulated to represent a gray scale.

19. (original) The field emission display device according to claim 15, wherein the anode portion is composed of a transparent substrate, transparent electrodes formed on the transparent substrate, phosphors of red (R), green (G) and blue (B) colors formed on a predetermined region of each transparent electrode, and a black matrix formed between the phosphors.

20. (cancelled).

21. (original) The field emission display device according to claim 15, wherein the cathode portion, the field emission-suppressing gate portion, and the field emission-inducing gate portion are opposed to the anode portion using a spacer as a support.

22. (original) The field emission display device according to claim 15, wherein the dielectric layer is formed on an entire surface or a part of the surface of the metal mesh.

Application Serial No. 10/573,518
Reply to office action of August 18, 2009

PATENT
Docket: CU-4737

23. (previously presented) The field emission display device according to claim 15, wherein a largest cross-section of the field emission-suppressing gate opening is equal to or smaller than one time to twenty times a thickness of the insulator layer.

24. (original) The field emission display device according to claim 15, wherein the penetrating hole of the metal mesh has at least one inclined inner wall.